AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.7.2.4

Carboxylic acids

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**17**
Available paper years	**2007–2023**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.7.2.4 Carboxylic acids

Answer 01 · Mark scheme

June 2007 | CHY1B | Original Q8 | Legacy

Eight	**2**	**4**	**1**	**2**

4.7.2.4 Carboxylic acids

Answer 02 · Mark scheme

Question 3

question	answers	extra information	mark
(a)	soft from vegetable oils only	accept **Z**	1
	contains the high(est) amount of polyunsaturated fat **or** the low(est) amount of saturated fat	ignore any values / percentages	1
(b)(i)	unsaturated		1
(a)(ii)	hydrogen		1
	higher		1
total			5

4.7.2.4 Carboxylic acids

Answer 02 · Mark scheme

January 2008 | CHY1F | Original Q3 | Legacy

CHY1F

Answer 03 · Mark scheme

March 2008 | CHY1BP | Original Q7 | Legacy

Seven	**1**	**4**	*	**4**

4.7.2.4 Carboxylic acids

Answer 04 · Mark scheme

June 2008 | CHY3F | Original Q3 | Legacy

question	answers	extra information	mark
3(a)(i)	(hydrochloric) acid carbon dioxide limewater		1 1 1
3(a)(ii)	sodium hydroxide ammonia litmus		1 1 1
3(b)	no distinctive colour (flame) owtte	allow: not a metal (ion) accept flame tests only identify single elements	1
Total			**7**

4.7.2.4 Carboxylic acids

Answer 04 · Mark scheme June 2008 | CHY3F | Original Q3 | Legacy

COMPONENT NUMBER: CHY3F

COMPONENT NAME: Chemistry

STATUS: Final

DATE: June 2008

Answer 05 · Mark scheme March 2010 | CHY1BP | Original Q4 | Legacy

Four	**A**	Kevlar	**3**
	B	Acrylic	**1**
	C	66 Nylon	**2**
	D	Polyester	**4**

4.7.2.4 Carboxylic acids

Answer 06 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)(i)	H^+		1
1(a)(ii)	OH^-		1
1(a)(iii)	lower than		1
1(b)	with HCl: UI goes red / pink has a pH 0 ,1 ,2 **or** 3 **or** with ethanoic acid: UI goes orange / yellow (1) has a pH 4 / or above (but less than 7) (1)	 allow a comparison eg redder than ethanoic acid allow a comparison eg has pH less than ethanoic acid. do **not** accept an incorrect pH. allow a comparison with HCl allow a comparison with HCl	 1 1
1(c)	completely		1
1(d)(i)	conical flask		1
1(d)(ii)	titration		1
1(d)(iii)	repeat **or** take average	allow compare with another students results	1
Total			**9**

4.7.2.4 Carboxylic acids

Answer 06 · Mark scheme June 2010 | CHY3F | Original Q1 | Legacy

CHY3F

Answer 07 · Mark scheme November 2010 | CHY1AP | Original Q3 | Legacy

Three	**A**	Biodiesel	**3**
	B	Methane	**2**
	C	Animal waste	**1**
	D	Dried sludge	**4**

4.7.2.4 Carboxylic acids

Answer 08 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)(i)	hydrogen		1
3(a)(ii)	partially		1
3(b)(i)	same size / mass / amount / length of magnesium (ribbon) **or** same concentration of acids	allow react for same time ignore repeats ignore volume / amount of acid	1
3(b)(ii)	bubbles / gas given off **or** magnesium disappears / dissolves / reacts slower with ethanoic acid **or** faster with hydrochloric acid		1 1
3(c)(i)	titration	allow titration identified in box if answer line blank	1
3(c)(ii)	burette		1
3(c)(iii)	(indicator) changed colour	allow solution changes colour but not vinegar ignore specific colours	1
Total			8

4.7.2.4 Carboxylic acids

Answer 08 · Mark scheme

January 2011 | CHY3F | Original Q3 | Legacy

CHY3F

4.7.2.4 Carboxylic acids

Answer 09 · Mark scheme

June 2011 | CHY3F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	sodium hydroxide solution blue		1 1
3(a)(ii)	barium chloride white		1 1
3(b)	fully ionised in water		1
3(c)(i)	H^+ ions		1
3(c)(ii)	lower than		1
3(d)(i)	(indicator) changed colour / goes colourless	ignore clear / discoloured	1
3(d)(ii)	13.9 **or** (titration) 2		1
3(d)(iii)	13.2	ecf from 3(d)(ii)	1
Total			**10**

4.7.2.4 Carboxylic acids

Answer 09 · Mark scheme

June 2011 | CHY3F | Original Q3 | Legacy

CHY3F

4.7.2.4 Carboxylic acids

Answer 10 · Mark scheme

June 2012 | CH1FP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	Olive oil does not dissolve in vinegar		1
5(a)(ii)	(the mustard is) an emulsifier	accept an emulsion has formed	1
5(b)(i)	double		1
5(b)(ii)	add bromine water – turns colourless		1
5(c)(i)	because the (olive) trees/plants/crops/leaves/fruit absorb/use carbon dioxide	allow carbon for carbon dioxide allow carbon dioxide is used in photosynthesis	1
5(c)(ii)	any **one** from: • olive oil is a food • olives are slow-growing • olives require a lot of land • not enough olive trees / oil • olive oil dense / viscous / high boiling point	ignore habitats ignore gives off carbon dioxide	1
Total			**6**

4.7.2.4 Carboxylic acids

Answer 10 · Mark scheme

June 2012 | CH1FP | Original Q5 | Legacy

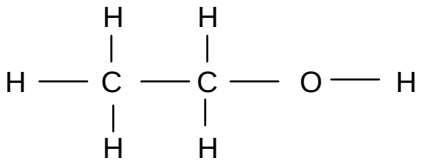
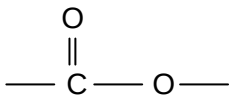
CH1FP

4.7.2.4 Carboxylic acids

Answer 11 · Mark scheme

June 2013 | CH3FP | Original Q8 | Legacy

Question 8

question	Answers	extra information	Mark
8(a)(i)		allow other arrangements provided connectivity is correct allow —OH	1
8(a)(ii)	oxygen oxidation	accept O_2 allow O allow oxidisation / oxidising / oxidised allow redox	1 1
8(b)(i)	ring around 		1
8(b)(ii)	ester(s)	do **not** allow ether(s)	1
8(b)(iii)	propanol	accept propan-1-ol allow propyl alcohol	1
Total			**6**

4.7.2.4 Carboxylic acids

Answer 12 · Mark scheme

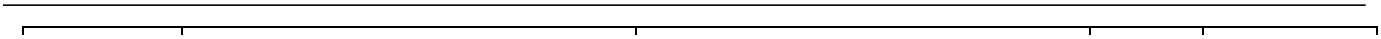
June 2015 | CH3FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	oxygen	allow correct answer shown in box if answer line blank	1	**AO2** 3.6.1.b
5(b)	vinegar	allow correct answer shown in box if answer line blank	1	**AO1** 3.6.1.c
5(c)	C		1	**AO1** 3.6.2.a
5(d)	Ester		1	**AO2** 3.6.3.a
5(e)	pleasant smell volatile	 allow low boiling point / evaporates	1 1	**AO1** 3.6.3.a
Total			**6**	

4.7.2.4 Carboxylic acids

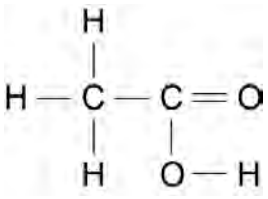
Answer 12 · Mark scheme

June 2015 | CH3FP | Original Q5 | Legacy



4.7.2.4 Carboxylic acids

Answer 13 · Mark scheme June 2016 | CH3FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
5(a)(i)	fizz / effervescence / bubbles	allow calcium carbonate decreases in size or dissolves	1	AO2/AO3 3.4.1d, 3.6.2b
	because carbon dioxide produced / released	allow because gas produced / released	1	
	limewater turns cloudy / milky / white		1	
	because (a precipitate of or solid) calcium carbonate forms	allow because of carbon dioxide if not already credited	1	
5(a)(ii)		allow –OH do not allow lower case 'h'	1	AO1 3.6.2a
5(a)(iii)	acid	must be in this order ignore any name of an acid	1	AO1 3.6.2b
	ester(s)		1	
5(b)	white (precipitate) no change no change no change	all four correct 2 marks any two correct 1 mark	2	AO2 3.4.1e,f
5(c)(i)	lilac red	must be in this order allow purple	1 1	AO1 3.4.1a
5(c)(ii)	colours are masked / changed by each flame colour		1	AO3 3.4.1a
Total			12	

4.7.2.4 Carboxylic acids

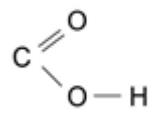
Answer 13 · Mark scheme

June 2016 | CH3FP | Original Q5 | Legacy

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / SpecRef</th></tr>
<tr><td>6</td><td></td><td></td><td>6</td><td rowspan="4">2AO1 / 3AO2 / 1AO3
3.4.1g</td></tr>
<tr><td colspan="4">Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a ‘best-fit’ approach to the marking.</td></tr>
<tr><td colspan="4"><table>
<tr><th>0 marks</th><th>Level 1 (1–2 marks)</th><th>Level 2 (3–4 marks)</th><th>Level 3 (5–6 marks)</th></tr>
<tr><td>No relevant content.</td><td>There is a simple description of using some of the apparatus.</td><td>There is a description of an experimental method including addition of acid to alkali which may include an indicator or colour change and may include a measurement of volume.</td><td>There is a description of titrations that would allow a comparison to be made between the two solutions of hydrochloric acid.</td></tr>
</table></td></tr>
<tr><td colspan="4">examples of chemistry points made in the response could include:
• acid in burette or flask
• alkali/sodium hydroxide or acid in burette or flask
• volume of acid or alkali measured using the pipette
• indicator in flask
• white tile under the flask
• slow addition
• swirling/mixing
• colour change of indicator
• burette volume measured</td></tr>
<tr><td>Total</td><td></td><td></td><td>6</td><td></td></tr>
</table>

4.7.2.4 Carboxylic acids

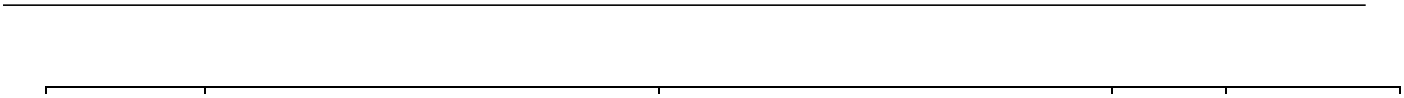
Answer 14 · Mark scheme June 2017 | CH3FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1 (a)(i)	numbers	allow number allow numbers circled in the box	1	AO1 3.1.2b
1 (a)(ii)	electrons	allow electron allow electrons circled in the box	1	AO1 3.1.2b
1 (b)(i)	Cl/chlorine	allow CL / cL / cl	1	AO1 3.1.3f
1 (b)(ii)	Cu/copper	allow CU / cU / cu	1	AO2 3.1.3c
1 (b)(iii)	7/seven		1	AO1 3.1.3e
1(c)(i)	tick (✓) by: displacement		1	AO1 3.1.3g
1(c)(ii)	tick (✓) by: Fluorine		1	AO3 3.1.3g
1(d)	tick (✓) by: yellow		1	AO1 3.4.1e
1(e)(i)	circle around: 		1	AO2 3.6.2a
1(e)(ii)	carbon dioxide	allow carbon dioxide circled in the box	1	AO2 3.6.2b
1(e)(iii)	esters	allow esters circled in the box allow ethers	1	AO2 3.6.2b
Total			11	

4.7.2.4 Carboxylic acids

Answer 14 · Mark scheme

June 2017 | CH3FP | Original Q1 | Legacy



4.7.2.4 Carboxylic acids

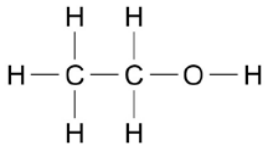
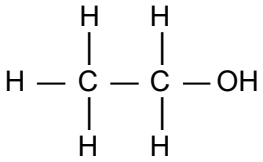
Answer 15 · Mark scheme

June 2018 | 8462/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	formulation		1	AO1 4.8.1.2
09.2	$\frac{23.3}{265.5 + 23.3 + 3.0 + 1.5}$ (× 100) = 7.9 (%)	an answer of 7.9 (%) scores **2** marks allow $\frac{23.3}{293.3}$ (× 100) allow 7.944084555 (%) rounded correctly	1 1	AO2 4.8.1.2
09.3	to deter consumption / drinking (by people)		1	AO3 4.7.2.3
09.4	any **one** from: • fuel • solvent • antiseptic	do **not** accept as an alcoholic drink allow specific uses eg • fuel additive • cleaning products • hand-sanitisers	1	AO2 4.7.2.3
09.5	ferment(ation) add yeast anaerobic (conditions) **or** warm	ignore distillation allow in the absence of oxygen allow a temperature value in range 5 – 45 °C inclusive allow room temperature ignore hot / heat ignore high temperature	1 1 1	AO1 4.7.2.3

4.7.2.4 Carboxylic acids

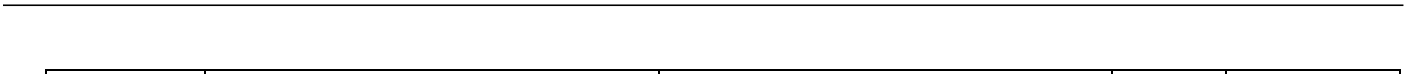
Answer 15 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6		allow 	1	AO1 4.7.2.3
09.7	hydrogen	allow H_2	1	AO1 4.7.2.3
09.8	oxidising (agent)	allow permanganate / dichromate ions allow [O] ignore oxygen	1	AO1 4.7.2.3
Total			**11**	

4.7.2.4 Carboxylic acids

Answer 15 · Mark scheme

June 2018 | 8462/2F | Original Q9

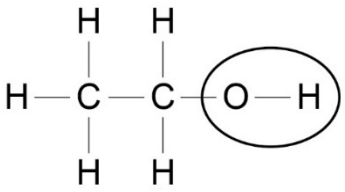


4.7.2.4 Carboxylic acids

Answer 16 · Mark scheme

November 2020 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1			1	AO1 4.7.2.3
07.2	<table><tr><th>Name of element</th><th>Symbol for element</th><th>Number of atoms in one molecule of ethanol</th></tr><tr><td>carbon</td><td>C</td><td>2</td></tr><tr><td>hydrogen</td><td>H</td><td>6</td></tr><tr><td>oxygen</td><td>O</td><td>1</td></tr></table>	ignore O_2	1 1 1	AO1 AO1 AO2 4.1.1.1 4.7.2.3
07.3	a solvent		1	AO2 4.7.2.3
07.4	sugar	allow named sugar allow saccharide	1	AO3 4.7.2.3
07.5	yeast		1	AO1 4.7.2.3
07.6	ethyl ethanoate		1	AO1 4.7.2.4

Question 7 (continued)

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	water	ignore H_2O	1	AO1 4.1.1.1 4.2.2.2 4.7.2.4
07.8	400 cm^3 = 0.40 dm^3 $\frac{1.00}{0.40}$ × 20 = 50 (g) **alternative approach:** 1.0 dm^3 = 1000 cm^3 (1) $\frac{1000}{400}$ × 20 (1) = 50 (g) (1)	 allow correct use of incorrectly converted or unconverted volume allow correct use of incorrectly converted or unconverted volume	1 1 1	AO2 4.7.2.4
Total			**12**	

4.7.2.4 Carboxylic acids

Answer 17 · Mark scheme

June 2023 | 8462/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	(mass =) $\frac{39.8}{29.6}$ (× 1) = 1.34 (g)	 allow 1.34459459 (g) correctly rounded to at least 2 significant figures	1 1	AO2 4.7.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	all six points plotted correctly	allow a tolerance of ± ½ a small square allow **1** mark for four or five points plotted correctly	2	AO2 4.7.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	40.6 (kJ)	allow a value in the range 40.4 – 40.8 (kJ) allow a value consistent with the plotted points	1	AO2 4.7.2.3

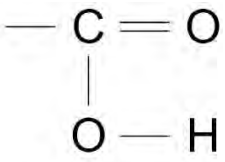
Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	calcium hydroxide		1	AO1 4.8.2.3

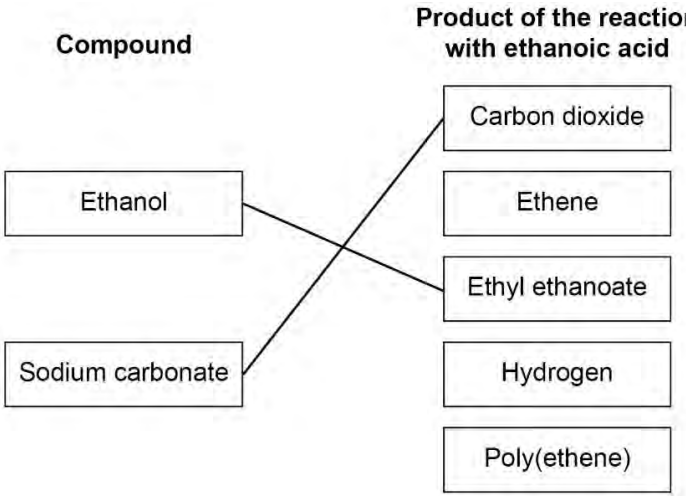
Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	(limewater turns) milky / cloudy	allow white precipitate (formed) allow calcium carbonate is produced	1	AO1 4.8.2.3

4.7.2.4 Carboxylic acids

Answer 17 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	an oxidising agent		1	AO1 4.7.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.7			1	AO1 4.7.2.4

Question	Answers	Mark	AO / Spec. Ref.
09.8	 do **not** accept more than **one** line from a box on the left	1 1	AO1 4.7.2.4

Total Question 9	11

4.7.2.4 Carboxylic acids

Answer 15 · Examiner comments

June 2018 | 8462/2F | Original Q9

Question 9 (standard demand)

09.1 2% of students recognised a formulation from this part of the specification.

09.2 This was a more difficult calculation as there were lots of numbers given in the question. It appeared to presented little difficulty for some students, however.

09.3 Reading the stem would have avoided answers such as 'to make it more attractive to drink'. 14% of students realised that it was to warn people not to drink it.

09.4 Uses of ethanol, and therefore methylated spirits, as a solvent, steriliser and fuel were well known with 42% of students achieving the mark.

09.5 Very few students knew about the production of ethanol from sugar solution by fermentation. Some knew the name of the process but could give no correct detail. 8% of students achieved two or three marks.

09.6 3% of students could complete the displayed formula for ethanol. Ethane was the most common answer, but more students did not attempt this question.

09.7 12% of students knew that hydrogen would be the gas produced.

09.8 Even fewer knew that an oxidising agent was required.

4.7.2.4 Carboxylic acids

Answer 17 · Examiner comments

June 2023 | 8462/2F | Original Q9

Question 9 (Standard demand)

09.1 The calculation discriminated well. More than 25% of students successfully completed the calculation, usually showing full details of their working. Students need to be sufficiently familiar with their calculator to understand when it is appropriate to include a recurring dot over one or more digits, and also when it is not. Weaker responses included rounding errors.

09.2 Around half of students obtained both marks for correctly plotting all the points. Over 20% of students incorrectly plotted at least two of the points, with the most frequently seen error being to incorrectly identify the number of carbon atoms present, for example, plotting ethanol as having one carbon atom. If a line of best fit was drawn, this was ignored, as this was not required and is inappropriate in the context of a discrete variable on the x-axis.

09.3 Over 40% of students gained this mark. Any line of best fit drawn was ignored. The answer, within the tolerances stated in the mark scheme, was estimated from the plotted points alone and was as stated in the mark scheme unless misplotted points (usually for hexanol and/or heptanol) suggested otherwise.

09.4 Over 30% of students gained this mark, but the other three distractors were all popular.

09.5 Over 40% of students gained this mark. A small number asserted that the limewater became colourless or clear.

09.6 Less than one third of students gained this mark. ‘Water’ was not a popular distractor, but ‘a halogen’ and ‘an alkali metal’ were both frequently selected.

09.7 The carboxylic acid functional group was not well known.
Less than 2% of students were able to successfully complete the displayed structural formula for this functional group. Many students completed a square of points around the 4 atoms provided.

09.8 Over 20% of students gained both marks and a further 40% gained 1 mark. A number of students drew multiple lines from the boxes on the left.